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(54) **Treatment of Alloy Steels**

(57) A treatment of a heat exchanger to reduce corrosion of alloy steel heat exchange tubes, the treatment comprising shot peening or grit blasting the bores of the tubes, heat treating to produce a fine grain structure and exposing the bores of the tubes to moist hydrogen during stress relieving heat treatment.

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SPECIFICATION

Treatment for Alloy Steels

This invention relates to treatment of alloy steels to reduce corrosion in water steam at high temperature.

Alloy steels such as, for example 9CrMo used for the manufacture of tube-in-shell heat exchangers, is subject to corrosion leading to metal loss and a requirement for chemical cleaning. It is known that selective pre-treatment of steels in moist hydrogen can improve corrosion resistance apparently due to the formation of a layer of chromium oxide on the surface. The object of the invention is to increase the effectiveness of such treatment in reducing the corrosion of alloy steels in water/steam by prior working of the surface combined with heat treatment.

According to the invention a treatment for ferritic alloy steel comprises the steps of cold working the surface, heat treating the steel to produce a substantially uniform layer of fine grain structure adjacent to the surface and exposing the surface to moist hydrogen at high temperature.

The fine grain structure of the surface of the steel facilitates chromium diffusion and consequently promotes the formation of a protective film of chromium oxide.

A temperature known to be suitable for treating the cold worked surface to produce a fine grain structure is 550°C but the treatment according to the invention is not limited in that value.

The invention will reside in a treatment for a tube-in-shell heat exchanger of 9CrMo steel used for heat exchange between steam and liquid metal wherein the steam is superheated in passage through the heat exchange tubes and it is envisaged that shot peening or grit blasting will be suitable processes for cold working the bores of the tubes.

It is also envisaged that the treatment will be suitable for a tube-in-shell heat exchanger of 9CrMo steel used for heat exchange between water and liquid metal wherein steam is generated from the water in passage through the heat exchange tubes.

After construction of a heat exchanger of 9 CrMo steel and cold working the bore of the tubes in accordance with the invention, the formation of a chromium oxide layer on the bores may be achieved by passing moist hydrogen through the tubes during a stress relieving heat treatment of the heat exchanger.

The main advantage stemming from treatment of heat exchangers according to the invention is thought to reside in decreased frequency of chemical cleaning and probably even to the elimination of the chemical cleaning process. Furthermore, it is expected that the useful life of the heat exchangers will be extended.

Claims

1. A treatment for ferritic alloy steel, the treatment comprising the steps of cold working the surface, heat treating the steel to produce a substantially uniform layer of fine grain structure adjacent to the surface and exposing the surface to moist hydrogen at high temperature.

2. A treatment for a heat exchange having heat exchange tubes of ferritic alloy steel, the treatment comprising the steps of cold working the bores of the tubes by shot peening or grit blasting, heating the tubes to 550°C to produce a substantially uniform layer of fine grain structure adjacent to the surfaces of the bores and exposing the surfaces to moist hydrogen during a stress relieving heat treatment of the heat exchanger.

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